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Patentanmeldung Nr. Patent application No. Demande de brevet n°

02079645.4

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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
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Fischer-tropsch catalyst composition

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ACH 2969 PDEP

FISCHER-TROPSCH CATALYST COMPOSITION

The present invention relates to a catalyst composition suitable for the conversion of carbon monoxide and hydrogen to C_5^+ hydrocabon mixtures, comprising a Fischer-Tropsch catalyst component and an acidic component. The invention further relates to a process for the conversion of carbon monoxide and hydrogen to C_5^+ hydrocabon mixtures using this catalyst.

It is known to convert carbon monoxide and hydrogen to larger hydrocarbons using a composition comprising a Fischer-Tropsch catalyst component and an acidic component.

For instance, US 4,595,702 discloses a Fischer-Tropsch process using an copper-containing iron catalyst as Fischer-Tropsch catalyst component and a zeolite selected from the group of ZSM-5, ZSM-45 and zeolite beta as the acidic component.

US 4,556,645 discloses the combined use of a Fischer-Tropsch catalyst component and a crystalline, microporous silicoaluminophosphate, non-zeolitic molecular sieve as the acidic component.

It has now been found that a better performance can be reached when zeolite Y is used as the solid acid. This zeolite Y may be steam-stabilized or non-steam-stabilized. More preferably, zeolite Y contains a metal compound, e.g. a transition metal and/or rare earth metal compound.

Hence, the present invention relates to a catalyst composition suitable for the conversion of carbon monoxide and hydrogen to C_5^+ hydrocabon mixtures, comprising

(a) a Fischer-Tropsch catalyst component, and

(b) zeolite Y.

This zeolite Y preferably has a SAR of above 4.0, more preferably 5.0-10.0 and preferably contains one or more metal compounds. Examples of suitable metals are rare earth metals, e.g. Ce, La, and transition metals of Groups IV-VIII of the Periodic System, e.g. V, Cr, Mn, Fe, Co, Ni, Cu, Zr, Nb, Ru, Re, etc.

The metal compound is preferably present in or on the zeolite in amounts of 0.1 to 10 wt%, more preferably 0.3 to 2 wt%, calculated as oxide.

The metal compound can be supported on the zeolite Y in any manner known in the art. Examples of such methods are impregnation, ion-exchange, and deposition precipitation of soluble metal salts.

If desired, the metal-containing zeolite Y is calcined after the metal compound has been deposited.

The Fischer-Tropsch catalyst component can be any conventional Fischer-Tropsch catalyst, preferably comprising iron and/or cobalt. For the preparation of such catalysts it is referred to, e.g., WO 01/97968, WO 01/89686/ and WO 01/70394.

The Fischer-Tropsch catalyst component can be promoted with various metals, e.g. Al, Ti, Cr, Mn, Ca, Na and/or K. Furthermore, the Fischer-Tropsch catalyst component can contain binder materials, such as silica and/or alumina.

The amount of zeolite Y in the catalyst composition according to the invention preferably ranges from 5 to 40 wt%, more preferably from 10 to 30 wt%, based on the total weight of the catalyst composition.

The catalyst composition can be a physical mixture of Fischer-Tropsch catalyst component particles and zeolite Y particles. On the other hand, the catalyst composition can also comprise one type of particle, containing both the Fischer-Tropsch catalyst component and the zeolite Y.

The invention further relates to a process for the conversion of carbon monoxide and hydrogen to C_5^+ hydrocarbon mixtures, said process comprising

contacting carbon monoxide and hydrogen with the above catalyst composition comprising a Fischer-Tropsch catalyst component and zeolite Y.
This process can be carried out in any suitable reactor, such as a (fixed) fluidised bed reactor.

This process is preferably a high-temperature Fischer-Tropsch process. The temperature ranges preferably from 250° to 400°C, more preferably from 300° to 370°C, and most preferably from 330° to 350°C. The pressure preferably ranges from 10 to 60 bar, more preferably 15 to 30 bar, and most preferably about 20 bar.

The H_2/CO volume ratio preferably ranges from 0.2 to 8.0, preferably 0.5-6, most preferably 1-3.

The resulting hydrocarbon product preferably contains, on a mass basis, at least 35%, more preferably at least 45%, and most preferably at least 50% of C_5^+ compounds. The process may be used for the production of aromatics, branched hydrocarbons, and/or olefins. Preferably, the process is used for the production of liquid fuel, especially gasoline and preferably unleaded gasoline.

CLAIMS

1. Catalyst composition suitable for the conversion of carbon monoxide and hydrogen to C_5^+ hydrocabon mixtures, comprising
   (a) a Fischer-Tropsch catalyst component, and
   (b) zeolite Y.

2. Catalyst composition according to claim 1 wherein the zeolite Y contains a metal compound.

3. Catalyst composition according to claim 2 wherein the metal compound comprises a metal selected from the group consisting of Group IV metals, Group V metals, Group VI metals, Group VII metals, Group VIII transition metals, rare earth metals, and combinations thereof.

4. Catalyst composition according to any one of claims 1-3 wherein the Fischer-Tropsch catalyst component comprises iron.

5. Catalyst composition according to any one of claims 1-3 wherein the Fischer-Tropsch catalyst component comprises cobalt.

6. Catalyst composition according to any one of the preceding claims wherein zeolite Y is present in the catalyst composition in an amount of 5 to 40 wt% based on the total weight of the catalyst composition.

7. Process for the conversion of carbon monoxide and hydrogen to C_5^+ hydrocabon mixtures, said process comprising contacting carbon monoxide and hydrogen with a catalyst composition according to any of the claims 1-6.

ACH 2969 PDEP

Abstract

The present invention relates to a catalyst composition suitable for the conversion of carbon monoxide and hydrogen to C_5^+ hydrocabon mixtures. This catalyst composition comprises a Fischer-Tropsch catalyst component and zeolite Y. Preferably, the zeolite contains one or more metal compounds.

PCT Application
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